Claims

What is claimed is:

1. A motor driver circuit comprising:
an H-switch circuit arranged for connection with one phase of a multi-phase step motor;
a switch driver interconnected with said H-switch and a bridge control circuit; and
a set point generator connecting with said bridge control circuit and said H-switch circuit for removal of excess phase current from said multi-phase step motor.

2. The motor driver circuit of Claim 1 including a pair of operational amplifiers and a pair of comparators interconnected together and with said bridge control circuit, said operational amplifiers being connected with said H-switch in feed back circuit arrangement.

3. The bridge control circuit of Claim 2 further including a phase current sensing resistor connecting with inputs to said operational amplifiers for providing a sensing current value to said operational amplifiers.

4. The bridge control circuit of Claim 2 wherein an output of one of said comparators connects with said bridge control circuit to provide a forward current to said bridge control circuit.

5. The bridge control circuit of Claim 2 wherein an output of another of said comparators connects with said bridge control circuit to provide a reverse current to said bridge control circuit.

6. The bridge control circuit of Claim 1 including means connecting between said set point generator and said bridge control circuit for providing a sign current value to said bridge control circuit.

7. The bridge control circuit of Claim 1 wherein said H-switch circuit includes a pair of upper switches and a pair of lower switches, wherein said one phase of said multi-phased stepper motor is connected in parallel with upper and lower switches.

8. The bridge control circuit of Claim 1 including a PWM oscillator connecting with said set point generator and said bridge control circuit for providing a test current value to said bridge control circuit.

9. The bridge control circuit of Claim 8 wherein said PWM oscillator further provides PWM oscillator timing value to said bridge control circuit.

10. The bridge control circuit of Claim 1 further including a step input to said set point generator for providing a set point current value to said set point generator.

11. The bridge control circuit of Claim 8 further including a max time circuit connecting with said PWM oscillator and said bridge control circuit for providing a maximum on time value to said PWM bridge control circuit.

12. The bridge control circuit of Claim 10 wherein said set point generator provides a wave front slope value to said PWM oscillator.

13. A method for removing excess phase current from a stepper motor comprising the steps of: determining an amount of current in one phase of a multiphase stepper motor;

comparing the one phase motor current to a predetermined test current value; and

reversing direction of the one phase motor current to reduce the one phase motor current to the test current value.

14. The method of Claim 13 including the steps of determining amounts of current in remaining phases of a multiphase stepper motor;

comparing the remaining phases motor currents to a predetermined test current value; and

reversing direction of the remaining phases motor currents to reduce the remaining phases motor currents to the test current value.

15. A method for controlling phase current in a stepper motor comprising the steps of:

determining the pulse width modulation frequency to control current in one phase of a multi-phase stepper motor;

determining an appropriate pulse width modulation frequency; and

adjusting a pulse width modulation frequency for the one phase current to a value less than said maximum pulse width modulation frequency.

16. The method of Claim 15 including the steps of: determining pulse width modulation frequencies for controlling current in remaining phases of a multi-phase stepper motor;

determining an appropriate pulse width modulation frequency; and

adjusting the remaining phases pulse width modulation frequencies to a value less than said maximum pulse width modulation frequency.

17. A method for limiting the maximum charge / discharge time of the current in one phase of a multi-phase step motor.

18. The method of claim 17 including the steps of: limiting the maximum charge / discharge time of the currents in remaining phases of a multi-phase stepper motor.